What is claimed is:

1. An electrolytic processing apparatus, comprising:

a substrate holder for holding a substrate;

a first electrode to make contact with the substrate for passing electricity to a processing surface of the substrate;

an electrode head including a high resistance structure and a second electrode, disposed opposite to and in this order from the substrate holder, and a polishing surface facing the processing surface of the substrate held by the substrate holder;

an electrolytic solution injection portion for injecting an electrolytic solution between the processing surface of the substrate held by the substrate holder and the second electrode;

a relative movement mechanism for moving the substrate holder and the electrode head relative to each other;

a press mechanism for pressing the polishing surface of the electrode head against the substrate held by the substrate holder; and

a power source for applying a voltage between the first electrode and the second electrode, said power source being capable of selectively switching the direction of electric current.

2. The electrolytic processing apparatus according to claim 1, wherein the polishing surface comprises an exposed surface of a polishing pad attached to the substrate-facing surface of the high resistance structure.

3. The electrolytic processing apparatus according to claim 2, wherein the polishing pad is made of a flexible and durable woven fabric, non-woven fabric, resin or resin foam.

4. The electrolytic processing apparatus according to claim 1, wherein the polishing surface comprises an exposed surface of a polishing pad supported by a support.

5. The electrolytic processing apparatus according to claim 4, wherein the polishing pad is made of a flexible and durable woven fabric, non-woven fabric, resin or resin foam.

6. The electrolytic processing apparatus according to claim 1, wherein the polishing surface comprises the lower surface of the high resistance structure which has undergone partial or entire modification or surface treatment.

7. The electrolytic processing apparatus according to claim 1, wherein the press mechanism is capable of

adjusting a pressing force applied to the processing surface of the substrate by the biasing force of a spring element.

8. The electrolytic processing apparatus according to claim 1, wherein the electrolytic solution is a plating solution or a solution of a plating solution containing an acidic solution.

9. An electrolytic processing apparatus, comprising:

a substrate holder for holding a substrate with its processing surface facing upward;

a first electrode to make contact with the substrate for passing electricity to the processing surface of the substrate;

an electrode head including a high resistance structure and a second electrode disposed above the high resistance structure, both disposed above the substrate holder, and a polishing surface facing the processing surface of the substrate held by the substrate holder;

an electrolytic solution injection portion for injecting an electrolytic solution between the processing surface of the substrate held by the substrate holder and the second electrode;

a relative movement mechanism for moving the substrate holder and the electrode head relative to each other;

a press mechanism for pressing the polishing surface of the electrode head against the substrate held by the substrate holder; and

a power source for applying a voltage between the first electrode and the second electrode, said power source being capable of selectively switching the direction of electric current.

10. The electrolytic processing apparatus according to claim 9, wherein the polishing surface comprises an exposed surface of a polishing pad attached to the substrate-facing surface of the high resistance structure.

11. The electrolytic processing apparatus according to claim 10, wherein the polishing pad is made of a flexible and durable woven fabric, non-woven fabric, resin or resin foam.

12. The electrolytic processing apparatus according to claim 9, wherein the polishing surface comprises an exposed surface of a polishing pad supported by a support.

13. The electrolytic processing apparatus according to claim 12, wherein the polishing pad is made of a flexible and durable woven fabric, non-woven fabric, resin or resin foam.

14. The electrolytic processing apparatus according to claim 9, wherein the polishing surface comprises the lower surface of the high resistance structure which has undergone partial or entire modification or surface treatment.

15. The electrolytic processing apparatus according to claim 9, wherein the press mechanism is capable of adjusting a pressing force applied to the processing surface of the substrate by the biasing force of a spring element.

16. The electrolytic processing apparatus according to claim 9, wherein the electrolytic solution is a plating solution or a solution of a plating solution containing an acidic solution.

17. An electrolytic processing apparatus, comprising:

a substrate holder for holding a substrate;

a first electrode to make contact with the substrate for passing electricity to a processing surface of the substrate;

a first electrode head and a second electrode head each including a high resistance structure and a second electrode disposed above the high resistance structure, both disposed above the substrate holder; and

a first electrolytic solution tray and a second electrolytic solution tray respectively for holding a first

electrolytic solution and a second electrolytic solution having different properties,

wherein the processing surface of the substrate held by the substrate holder is subjected to a first electrolytic processing using the first electrolytic solution and the first electrode head, and a second electrolytic processing using the second electrolytic solution and the second electrode head.

18. The electrolytic processing apparatus according to claim 17, wherein at least one of the first electrode head and the second electrode head further includes a polishing surface facing the processing surface of the substrate held by the substrate holder, and a press mechanism for pressing the polishing surface against the substrate held by the substrate holder.

19. The electrolytic processing apparatus according to claim 17, wherein the first electrode head and the second electrode head are comprised of a single electrode head.

20. The electrolytic processing apparatus according to claim 17, wherein the first and second electrolytic solutions are plating solutions having different compositions.

21. The electrolytic processing apparatus according to claim 17, wherein at least one of the first and second electrolytic solutions is an etching solution.

22. An electrolytic processing method, comprising:

holding a substrate while allowing a processing surface of the substrate to be in contact with a first electrode;

disposing a high resistance structure and a second electrode opposite to and in this order from the substrate;

filling the space between the first electrode and the second electrode with an electrolytic solution, and applying a voltage therebetween;

carrying out electroplating of the processing surface of the substrate with the first electrode as a cathode and the second electrode as an anode while providing a space above or below the processing surface; and

carrying out electrolytic etching of the processing surface of the substrate with the first electrode as an anode and the second electrode as a cathode while rubbing the processing surface of the substrate with a polishing surface.

23. The electrolytic processing method according to claim 22, wherein the electrolytic processing is carried out while moving the substrate and the polishing surface relative to each other.

24. An electrolytic processing method, comprising:

holding a substrate while allowing a processing surface of the substrate to be in contact with a first electrode;

disposing a high resistance structure and a second electrode opposite to and in this order from the substrate;

filling the space between the first electrode and the second electrode with an electrolytic solution and applying a voltage therebetween;

carrying out electroplating of the processing surface of the substrate with the first electrode as a cathode and the second electrode as an anode while allowing the polishing surface to be in contact with the processing surface of the substrate; and

carrying out electrolytic etching of the processing surface of the substrate with the first electrode as an anode and the second electrode as a cathode while rubbing the processing surface of the substrate with a polishing surface.

25. An electrolytic processing method, comprising:

holding a substrate while allowing a processing surface of the substrate to be in contact with a first electrode;

disposing a high resistance structure and a second electrode opposite to and in this order from the substrate;

filling the space between the first electrode and the second electrode with a first electrolytic solution and

applying a voltage therebetween to carry out a first electrolytic processing;

disposing a high resistance structure and a second electrode opposite to and in this order from the substrate; and

filling the space between the first electrode and the second electrode with a second electrolytic solution and applying a voltage therebetween to carry out a second electrolytic processing.

26. The electrolytic processing method according to claim 25, wherein the first electrolytic processing and the second electrolytic processing are plating processings using plating solutions having different compositions as the electrolytic solutions.

27. The electrolytic processing method according to claim 25, wherein at least one of the first electrolytic processing and the second electrolytic processing is an etching processing using an etching solution as the electrolytic solution.